Perspective Evaluation of a Poultry-Breeding Enterprise Financial Resources Based on Seasonal Decomposition

Kadochnikova E.I[1]., Sungatullina L.B.[2], Agzamova R. R.[3], Abduazizova G. Sh.[4]

[1]*PhD in Economics, Associate Professor, Institute of Management, Economics and Finance, Dept. economics theory and econometrics, [1]Kazan Federal University, Russia.*

[2]*PhD in Economics, Associate Professor, Institute of Management, Economics and Finance, [1]Kazan Federal University, Russia.*

[3]*Institute of Management, Economics and Finance, Bachelor's Center in Economics, [1]Kazan Federal University, Russia.*

[4]*Bachelor, Institute of Management, Economics and Finance, Bachelor's Center in Economics, [1]Kazan Federal University, Russia.*

Abstract

The authors used prospective estimates of revenue and accounts receivable, obtained on the basis of an additive trend-seasonal model, to forecast the poultry enterprise financial resources. The study highlights the fact that the classical decomposition of the trend-seasonal model into trend, seasonal and random components is possible and convenient for forecasting the financial resources of a poultry enterprise that has a seasonality in production. The forecast estimates presented in the article confirmed the main hypothesis of the study – if there are objective seasonal fluctuations for a poultry enterprise, there is a tendency to increase sales revenue and accounts receivable due to limited customer liquidity. The results of the obtained empirical estimates confirmed the practical use feasibility of an additive trend-seasonal model based on the classical decomposition for predicting the financial resources of a poultry enterprise.

Keywords: sales revenue, accounts receivable, forecast, seasonal decomposition, trend-seasonal model

I. INTRODUCTION

It is necessary to conduct a financial resources full forecast analysis of activities for poultry enterprise stable operation. The seasonal trend of poultry production is determined by the birds' physiology. Modern technologies for keeping birds allow smoothing out seasonal fluctuations in production to some extent. However, the high susceptibility of birds to various seasonal factors does not allow to achieve completely rhythmic production. Accounting for seasonal fluctuations is of great practical importance for overcoming or mitigating them and is especially necessary when forecasting and planning the main indicators of the enterprise. A prognostic analysis of revenue and receivables makes it possible to identify trends in the financial resources of an enterprise, indicate to management the paths for further successful development, point out errors in economic activity, and also identify reserves for the financial results growth, which ultimately allows more successful activities [1; 2; 3; 4]. Analysis of of a poultry enterprise allows one providing timely management with information forming an objective opinion on the activities for the reporting period compared to the previous year, as well as identifying factors that caused changes in the indicators of financial resources and develop measures to optimize their receipt and use [5;6;7;8]. The financial resources growth strengthens the company's position in the production and financial sphere, as well as stimulates the investment inflow [9;10; 11]. There is an analysis of the long - and medium-term outlook, but a detailed and accurate forecast is not possible in the long term [12]. Due to this, short-term forecasts are often used, since their results are more accurate and reliable [13; 14]. Predictive analysis serves as the basis for making decisions on the development and improvement of the organization's functioning. Therefore, the purpose of this study is to forecast revenue from sales and receivables as sources of the enterprise financial resources. The main hypothesis of the study is that if there are objective seasonal fluctuations for a poultry enterprise, there is a tendency for sales revenue to grow and accounts receivable to grow.

II. METHODS

We used the quarterly data on revenue and accounts receivable of poultry enterprises from 2016 to 2020 for the purpose of forecasting. The trend and the decomposition method that the forecast will be based on should be chosen depending on the tasks set for the forecaster, as well as considering all the advantages and disadvantages of known methods. This study uses an additive trend-seasonal model based on the classical decomposition:

$$Y_t = T_t + S_t + E_t,$$

where T_t - time trend, regular component that characterizes the overall development trend;

S_t - seasonal component, which is characterized by the seasonal fluctuations period duration, their amplitude;

E_t - a random component that represents small deviations that cannot be predicted in the long term.

Building a model is reduced to calculating the values of T, S, and E for each level of the series. The method of building an additive model includes the following steps:

1. alignment of the source series using the moving average method;

2. assessment of the seasonal component;

3. analytical alignment of sequence level of (T+E);

4. calculating T values using the obtained trend equation;

5. calculating the series levels using an additive model, multiplying the T levels by the values of the seasonal component for the corresponding quarters;

6. calculating the error in the additive model.

III. RESULTS AND DISCUSSION

The time series graph of the company's revenue indicates seasonal fluctuations. During the year, revenue increases in the 3rd quarter. This is due to the specifics of the organization, since the largest revenue is generated during the summer-autumn period.
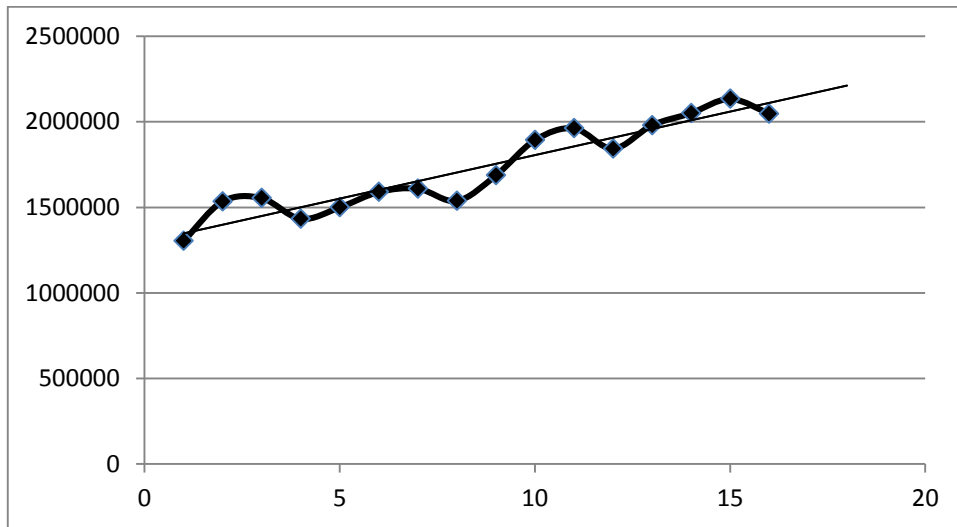

Fig. 1. Dynamics of the company's revenue for 2016-2019

The calculation of the seasonal component estimates at the first stage of decomposition is presented in Table 1.

Table 1. Calculation of the seasonal components estimates in the revenue of the enterprise

Period	Revenue	3-quarter moving average	Seasonal component estimate
Q1 2016	1304573	-	-
Q2 2016	1535235	1464780	70454,67
Q3 2016	1554533	1507742	46791,33
Q4 2016	1433457	1496189	-62732,3
Q1 2017	1500578	1508199	-7621,33
Q2 2017	1590563	1567012	23550,67
Q3 2017	1609896	1579611	30284,67
Q4 2017	1538375	1611898	-73523
Q1 2018	1687423	1706495	-19072
Q2 2018	1893687	1847895	45791,67
Q3 2018	1962576	1900013	62563
Q4 2018	1843776	1928957	-85181,3
Q1 2019	1980520	1958585	21935,33
Q2 2019	2051458	2055519	-4061
Q3 2019	2134579	2077860	56719,33
Q4 2019	2047542	-	-

At the next stage, we will adjust the estimate of the seasonal component. To do this, we find the total amount of estimates for the n-th quarter. The average estimate of the seasonal component is the arithmetic mean of the total sum of the estimates. We calculate the sum of the average estimates of the seasonal component and compare with the zero value.

Seasonal effects should be mutually repaid, and when using the additive model, the sum of the average estimates of the seasonal component should be zero. Multiplying each value of the seasonal component estimate by the obtained coefficient, we get adjusted estimates of the seasonal component.

Table 2. Calculation of the seasonal component average estimates

Year	Quarter				Sum
	1	2	3	4	
2016	-	70454,67	46791,33	-62732,3	
2017	-7621,33	23550,67	30284,67	-73523	
2018	-19072	45791,67	62563	-85181,3	
2019	21935,33	-4061	56719,33		
Total for the n-th quarter	-4758	135736	196358,3	-221437	
Average seasonal component estimate for the nth quarter, Sn avg	-1586	33934	49089,58	-73812,2	7625,361
Adjusted seasonal component estimate, Sn	-3492,34	32027,66	47183,24	-75718,6	0

To identify the trend component at the next stage of decomposition, we use the linear trend formula [15,16]:

$Y_t = a_0 + a_1 * t$,

where Y_t – revenue-line-aligned revenue;

a_0 – free member; a_1 – trend equation coefficient;

t – quarter.

To calculate the coefficients of the trend component, we use the usual least-squares method [17; 18] and MS Excel. We determine the predicted revenue values ($T_t + S_t$), model errors and present them graphically.

Table 3. Calculation of revenue after decomposition

| Period	Yt	St	Tt+Et=Yt-St	Tt	Tt+St	Yt-(Tt+S)
1	1304573	-3492,34	1308065	1338915	1335423	-30850
2	1535235	32027,66	1503207	1390966	1422994	112241
3	1554533	47183,24	1507350	1443017	1490201	64332,34
4	1433457	-75718,6	1509176	1495068	1419350	14107,1
5	1500578	-3492,34	1504070	1547120	1543627	-43049,2
6	1590563	32027,66	1558535	1599171	1631198	-40635,2
7	1609896	47183,24	1562713	1651222	1698405	-88508,9
8	1538375	-75718,6	1614094	1703273	1627554	-89179,1
9	1687423	-3492,34	1690915	1755324	1751831	-64408,4
10	1893687	32027,66	1861659	1807375	1839402	54284,58
11	1962576	47183,24	1915393	1859426	1906609	55966,95
12	1843776	-75718,6	1919495	1911477	1835758	8017,703
13	1980520	-3492,34	1984012	1963528	1960036	20484,43
14	2051458	32027,66	2019430	2015579	2047607	3851,383
15	2134579	47183,24	2087396	2067630	2114813	19765,75
16	2047542	-75718,6	2123261	2119681	2043962	3579,507
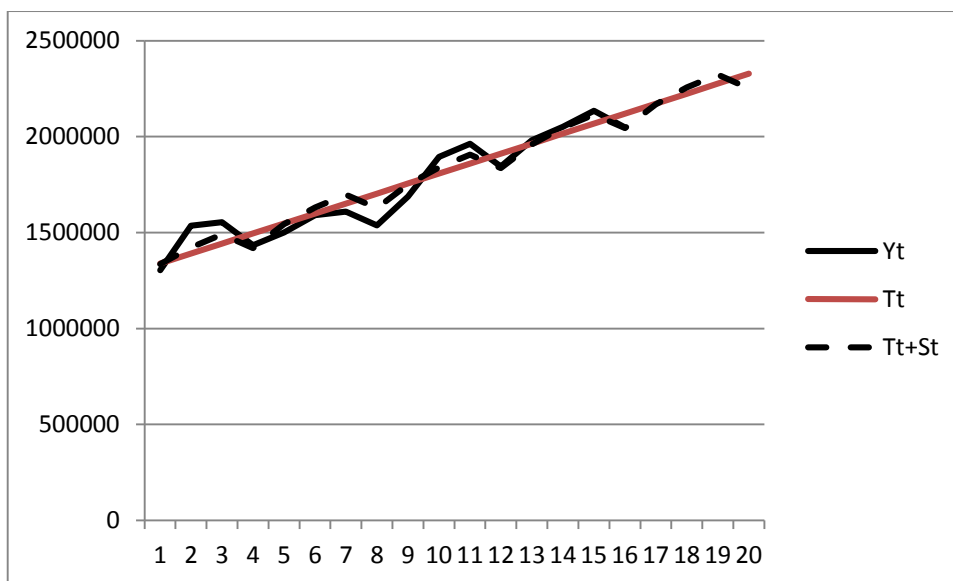
Fig. 2. Actual and post-forecast values of the company's revenue

Using the seasonal component and trend values for 2020, we find the forecast data for the next 4 quarters (Table 4). Predicted values do not contain a random Et component.

Table 4. Revenue forecast of the company for 2019-2021

Period	St	Tt	Tt+ St
Q1 2020	-3492,34	2171732	2168240
Q2 2020	32027,66	2223783	2255811
Q3 2020	47183,24	2275834	2323017
Q4 2020	-75718,6	2327885	2252167

Table 4 shows that the smallest revenue is expected in the first quarter of 2020, and the largest revenue is expected in the third quarter of 2020.

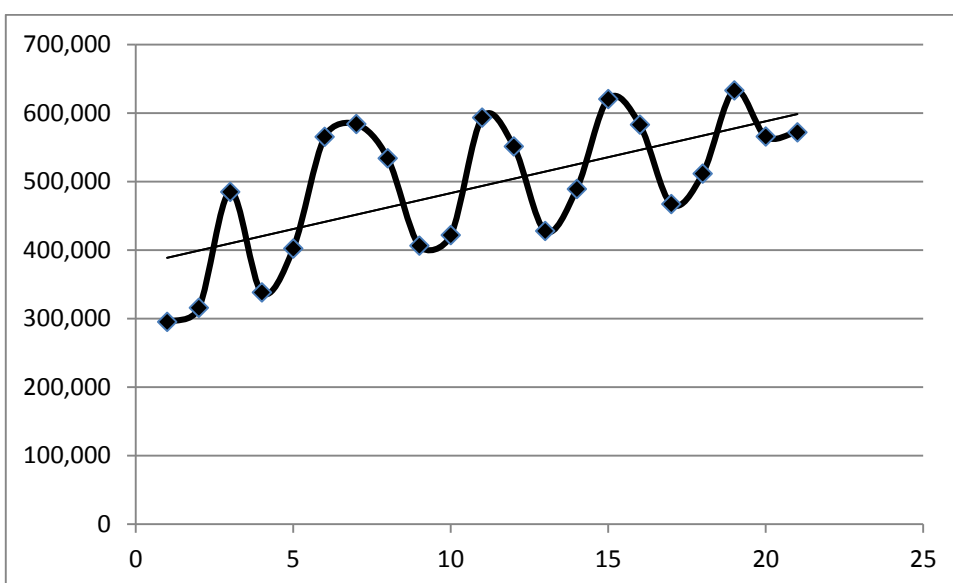Time series graph of accounts receivable (Fig.3) indicates seasonal fluctuations.

Fig. 3. Dynamics of the company's accounts receivable for 2015-2019

The forecast analysis of accounts receivable is presented in Tables 5,6 and in Figure 4.

Table 5. Calculation of the company's accounts receivable after decomposition

Period	Yt	St	Tt+Et= Yt-St	Tt	Tt+St	Yt-(Tt+St)
1	255 123	-45 693,23	30 0816,23	354 892,32	309 199,09	-54 076,09
2	275 640	-18 089,97	293 729,97	369 374,74	351 284,77	-75 644,77
3	445 141	67 487,77	377 653,23	383 857,16	451 344,92	-62 03,92
4	298 259	-3 704,57	301 963,57	398 339,58	394 635,01	-96 376,01
5	414 875	-45 693,23	460 568,23	412 822,00	367 128,76	47 746,24
6	577 855	-18 089,97	595 944,97	427 304,41	409 214,45	168 640,55
7	596 259	67 487,77	528 771,23	441 786,83	509 274,60	86 984,40
8	546 471	-3 704,57	550 175,57	456 269,25	452 564,69	93 906,31
9	360 716	-45 693,23	406 409,23	470 751,67	425 058,44	-64 342,44
10	365 939	-18 089,97	384 028,97	485 234,09	467 144,12	-101 205,12
11	567 606	67 487,77	500 118,23	499 716,51	567 204,28	401,72
12	495 718	-3 704,57	499 422,57	514 198,93	510 494,36	-14 776,36
13	470 835	-45 693,23	516 528,23	528 681,35	482 988,11	-12 153,11
14	572 229	-18 089,97	590 318,97	543 163,77	525 073,80	47 155,20
15	683 476	67 487,77	615 988,23	557 646,19	625 133,95	58 342,05
16	646 179	-3 704,57	649 883,57	572 128,60	568 424,04	77 754,96
17	492 218	-45 693,23	537 911,23	586 611,02	540 917,79	-48 699,79
18	536 374	-18 089,97	554 463,97	601 093,44	583 003,48	-46 629,48
19	657 946	6 7487,77	590 458,23	615 575,86	683 063,63	-25 117,63
20	590 647	-3 704,57	594 351,57	630 058,28	626 353,71	-35 706,71

Table 6. Forecast of the company's accounts receivable in 2020

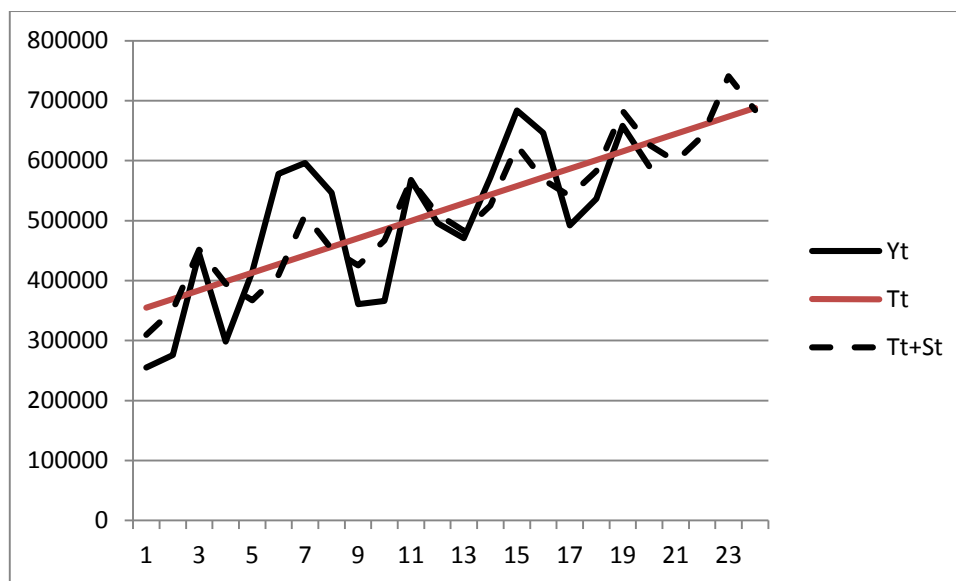| Period	St	Tt	St*Tt
Q1 2020	-45 693,23	644 540,70	598 847,47
Q2 2020	-18 089,97	659 023,12	640 933,15
Q3 2020	67 487,77	673 505,54	740 993,30
Q4 2020	-3 704,57	687 987,96	684 283,39

Fig. 4. Actual and post-forecast values of the company's accounts receivable

According to the forecast values made using the additive time series model, the smallest amount of accounts receivable is expected in the first quarter of 2020 – 598,847. 47 thousand rub, the largest amount of debt - in the 3rd quarter of 2020 (740 993.30 thousand. rub).

IV. SUMMARY

Based on the financial resources forecast of the poultry enterprise, the following conclusions can be drawn:

- there is a steady growth trend in revenue from sales and receivables, while the amplitude of fluctuations in the values of forecasted indicators reaches a maximum value in each 3rd quarter of the analyzed period. This is due to the seasonality of poultry production.

It is necessary to note that the poultry industry depends on the level of egg production, service life and safety of laying hens, the level of broilers' productive capabilitie usage, meat marketability, preservation of young animals, feed consumption – all this leads to additional costs that reduce the profit of the organization. Therefore, the company should pay attention to reducing the level of unproductive costs, reducing the production costs, as well as increasing the quality of fertilizers, seeds and feed.

V. CONCLUSIONS

The forecast estimates of the company's revenue from sales received in the study confirm the hypothesis of profit from sales steady growth. This will be possible due to uniform output, efficient use of fixed assets, and elimination of working time losses. In conditions of inflation, deferred payment leads to the fact that the company actually receives only a part of the cost of products sold, so to reduce the company's accounts receivable, it is necessary to regularly and promptly implement a number of the following measures:

- analyze the composition and structure of accounts receivable for specific customers, as well as the terms of debt formation and the terms of their possible repayment;

- analyze the ratio of receivables and payables;

 - monitor the turnover of receivables and payables, the status of settlements on overdue debts.

ACKNOWLEDGEMENTS

REFERENCES

[1] Kulikova LI, Garyncev AG, Goshunova AV. Doubtful debts allowance develoment: Stages and methods of calculation. Mediterranean Journal of Social Sciences. 2015 Feb 28;6(1 S3):448.

[2] Sokolov AY, Elsukova TV. Using ABC to enhance throughput accounting: an integrated management approach. Academy of Strategic Management Journal. 2016 Jan 7;15:8-15.

[3] Bieliková T, Bányiová T, Piterková A. Prediction techniques of agriculture enterprises failure. Procedia Economics and Finance. 2014 Jan 1;12:48-56.

[4] Sungatullina LB, Neizvestnaya DV, Kadochnikova EI. The Efficiency Analysis of Measures to Improve the Labor Productivity. The Journal of Social Sciences Research. 2018;4:260-6.

[5] Dias CS, Rodrigues RG, Ferreira JJ. What's new in the research on agricultural entrepreneurship?. Journal of rural studies. 2019 Jan 1;65:99-115.

[6] Ding Y, Wang L, Li Y, Li D. Model predictive control and its application in agriculture: A review. Computers and Electronics in Agriculture. 2018 Aug 1;151:104-17.

[7] Fenyves V, Tarnóczi T, Zsidó K. Financial Performance Evaluation of agricultural enterprises with DEA Method. Procedia Economics and Finance. 2015 Jan 1;32(15):423-31.

[8] Fitz-Koch S, Nordqvist M, Carter S, Hunter E. Entrepreneurship in the agricultural sector: A literature review and future research opportunities. Entrepreneurship Theory and Practice. 2018 Jan;42(1):129-66.

[9] Gellynck X, Cárdenas J, Pieniak Z, Verbeke W. Association between innovative entrepreneurial orientation, absorptive capacity, and farm business performance. Agribusiness. 2015 Jan;31(1):91-106.

[10] Giannakis E, Bruggeman A. The highly variable economic performance of European agriculture. Land Use Policy. 2015 May 1;45:26-35.

[11] Grande J, Madsen EL, Borch OJ. The relationship between resources, entrepreneurial orientation and performance in farm-based ventures. Entrepreneurship and Regional Development. 2011 Apr 1;23(3-4):89-111.

[12] Kadochnikova EI, Zapparova ZN, Sungatullina LB. The analysis of resource productivity factors: the models on panel data. Journal of Advanced Research in Dynamical and Control Systems. 2018;10(10 Special Issue):1735-40.

[13] Uzun V, Shagaida N, Lerman Z. Russian agriculture: Growth and institutional challenges. Land Use Policy. 2019 Apr 1;83:475-87.

[14] Nesterov VN, Kozlova NN. Methodology for the technical and economic analysis of a product at the projection stage. InIssues and Trends in Interdisciplinary Behavior and Social Science 2018 May 20 (pp. 117-124). CRC Press.

[15] Stock JH, Watson MW. *Introduction to Econometrics*. 3rd Edition, Harvard University, Princeton University. 2011.

[16] Lyzhova AV, Kadochnikova EI, Karimova GZ. Forecasting Financial Performance of Agricultural Enterprises Based on Supply Chain Operation in Seasonal Decomposition. Int. J Sup. Chain. Mgt Vol. 2019 Oct;8(5):241-248.

[17] Greene WH. *Econometric Analysis*. 8th Edition, Stern School of Business, New York University. 2018.

[18] Wooldridge JM. *Introductory Econometrics. A modern approach*. 5th edition, Michigan State University, South-Western, 2013.